

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (REV. 11-26-01)		ATTORNEY'S DOCKET NUMBER VMP-491-A
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/856815
INTERNATIONAL APPLICATION NO. PCT/EP99/07327	INTERNATIONAL FILING DATE 04 October 1999	PRIORITY DATE CLAIMED 28 November 1998
TITLE OF INVENTION DEVICE FOR DETECTING PARTICLES ON A WINDSHIELD		
APPLICANT(S) FOR DO/EO/US Heiner Bayha, Jurgen Benz, and Werner Philippss		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> has been communicated by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <p>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is attached hereto. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <ol style="list-style-type: none"> <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> have been communicated by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). Unsigned Copy</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>		
Items 11 to 20 below concern document(s) or information included:		
<p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p>14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>15. <input checked="" type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: Red-Lined Specification</p>		

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<p>21. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5):</p> <p>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1000.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00</p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)..... \$100.00</p>																											
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<p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">CLAIMS</td> <td style="width: 25%;">NUMBER FILED</td> <td style="width: 25%;">NUMBER EXTRA</td> <td style="width: 25%;">RATE</td> <td style="width: 10%;"></td> </tr> <tr> <td>Total claims</td> <td>13 - 20 =</td> <td></td> <td>x \$18.00</td> <td>\$</td> </tr> <tr> <td>Independent claims</td> <td>1 - 3 =</td> <td></td> <td>x \$80.00</td> <td>\$</td> </tr> <tr> <td colspan="4">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td> <td>+ \$270.00</td> </tr> </table>			CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		Total claims	13 - 20 =		x \$18.00	\$	Independent claims	1 - 3 =		x \$80.00	\$	MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00					
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<p><input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"><input type="checkbox"/></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td colspan="4">SUBTOTAL =</td> <td>\$ 990</td> </tr> </table>			<input type="checkbox"/>					SUBTOTAL =				\$ 990															
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<p>Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + \$ 0</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"><input type="checkbox"/></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td colspan="4">TOTAL FEES ENCLOSED =</td> <td>\$ 990</td> </tr> </table>			<input type="checkbox"/>					TOTAL FEES ENCLOSED =				\$ 990															
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<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ 990.00 to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 250-T113. A duplicate copy of this sheet is enclosed.</p> <p>d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p>																											
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.</p> <p>SEND ALL CORRESPONDENCE TO</p> <p>Andrew R. Basile YOUNG & BASILE, PC 3001 West Big Beaver Road Suite 624 Troy, MI 48084 248-649-3333</p> <p> SIGNATURE William M. Hanlon, Jr. NAME 28422 REGISTRATION NUMBER</p>																											

09/856815

JC18 Rec'd PCT/PTO 25 MAY 2001

Our Reference: VMP-491-A

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Heiner Bayha, Jurgen Benz, and Werner Phillips

Serial Number: Unknown

Filing Date: Concurrent

Examiner/Art Group Unit: Unknown/Unknown

Title: DEVICE FOR DETECTING PARTICLES ON A WINDSHIELD

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified patent application as indicated below.

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In the claims:

1 1. (Amended) A device for detecting particles on a windshield
2 a motor vehicle with a radiation source which emits optical rays onto the
3 windshield with a photodetector which receives a portion of the rays emitted onto
4 the windshield, and with a control unit, which manages the radiation source and
5 analyzes the rays received by the photodetector characterized in that the
6 radiation source is positioned outside the field of vision of a driver of the vehicle
7 and is aligned in such a way that the light rays from the radiation source strike
8 the windshield in the area of the field of vision, and that the photodetector is
9 pointed at the area of the windshield which the optical rays from the radiation
10 source strike.

1 2. (Amended) The device in accordance with claim 1, wherein
2 the radiation source is formed as a light-emitting-diode.

1 3. (Amended) The device in accordance with claim 1, wherein
2 the photodetector includes several receiving units.

1 4. (Amended) The device in accordance with claim 3, wherein
2 the receiving units are formed as optoelectronic arrays.

1 5. (Amended) The device in accordance with claim 3, wherein
2 means are located in the direction of propagation of the beams reflected from
3 the particles in front of the receiving units for focusing the beams.

1 6. (Amended) The device in accordance with claim 5, wherein
2 the means for focusing the beams are formed as lenses.

1 7. (Amended) The device in accordance with claim 1, wherein
2 the radiation source emits optical rays with a wavelength of about 350 nm to 800
3 nm.

1 8. (Amended) The device in accordance with claim 1, wherein
2 the radiation source emits optical rays with a wavelength in the infrared range.

1 9. (Amended) The device in accordance with claim 1, wherein
2 the control unit manages the radiation source in such a way that the type of
3 particles can be determined from the rays received by the photodetector.

4 10. (Amended) The device in accordance with claim 1, wherein
5 the control unit analyzes the rays received by the detector so that the type of
6 particles can be determined.

1 11. (Amended) The device in accordance with claim 1, wherein
2 the device is an integral part of an interior light module in the vehicle.

3 12. (Amended) The device in accordance with claim 1, wherein
4 the device is an integral part of a rearview mirror module in the vehicle.

5 13. (Amended) The device in accordance with claim 1, wherein
6 the device is connected over a bidirectional data bus to a superordinate control
7 unit in the vehicle.

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REMARKS

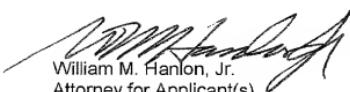
After entry of this amendment, claims 1 - 13 are amended to place the claims in idiomatic English and preferred United States claim format. The claim amendments are not made to address any issues of patentability or art.

A hand-written, corrected copy of the specification is enclosed showing the changes which have been made to the specification as required by Section 608.01(Q) and 714.20(1) of the Manual of Patent Examining Procedure. The Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States patent practice. The Substitute Specification includes no new subject matter; but does include the same changes handwritten in red in the attached, corrected, original specification. Entry of the Substitute Specification is respectfully requested.

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of this amendment is requested.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD
& HELMHOLDT, P.C.



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Troy, Michigan 48084-3107

Dated: May 25, 2001
WMH/dge/jo

VERSION OF CLAIM AMENDMENTS WITH MARKINGS
TO SHOW CHANGES MADE

In the claims:

1. (Amended) [Device (1)] A device for detecting particles [(2)] on a windshield [(3)] of a motor vehicle [(10).] with a radiation source [(4)] which emits optical rays [(5)] onto the windshield [(3)] with a photodetector [(6).] which receives a portion of the rays [(5)] emitted onto the windshield [(3)], and with a control unit [(8)], which manages the radiation source [(4)] and analyzes the rays [(7)] received by the photodetector [(6)] characterized in that the radiation source [(4)] is positioned outside the field of vision of a driver of the vehicle [(10)] and is aligned in such a way that the light rays [(5)] from the radiation source [(4)] strike the windshield in the area of the field of vision, and that the photodetector [(6)] is pointed at the area of the windshield [(3)] which the optical rays [(5)] from the radiation source [(4)] strike.

2. (Amended) [Device (1)] The device in accordance with claim 1, wherein the radiation source [(4)] is formed as a light-emitting-diode [(LED)].

3. (Amended) [Device (1)] The device in accordance with claim 1 [or 2], wherein the photodetector [(6)] [possesses] includes several receiving units.

4. (Amended) [Device (1)] The device in accordance with claim 3, wherein the receiving units are formed as optoelectronic arrays [such as, for example, charge-coupled device (CCD) image converters].

5. (Amended) [Device (1)] The device in accordance with claim 3 [or 4], wherein means [(12)] are located in the direction of propagation of the beams [(7)] reflected from the particles [(2)] in front of the receiving units for focusing the beams.

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6. (Amended) [Device (1)] The device in accordance with claim 5, wherein the means [(12)] for focusing the beams are formed as lenses.

7. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 6], wherein the radiation source [(4)] emits optical rays [(5)] with a wavelength of about 350 nm to 800 nm.

8. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 6], wherein the radiation source [(4)] emits optical rays [(5)] with a wavelength in the infrared range.

9. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [and 8], wherein the control unit [(8)] manages the radiation source [(4)] in such a way that the type of particles can be determined from the rays [(7)] received by the photodetector.

10. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 9], wherein the control unit [(8)] analyzes the rays received by the detector [(7)] [by means of suitable algorithms] so that the type of particles [(2)] can be determined.

11. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 10], wherein the device [(1)] is an integral part of an interior light module in the vehicle [(10)].

12. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 10], wherein the device [(1)] is an integral part of a rearview mirror module in the vehicle [(10)].

13. (Amended) [Device (1)] The device in accordance with [one of the claims] claim 1 [to 12], wherein the device [(1)] is connected over a bidirectional data bus to a superordinate control unit in the vehicle [(10)].

SUBSTITUTE SPECIFICATION

Our Reference: VMP-491-A

PATENT

DEVICE FOR DETECTING PARTICLES ON A WINDSHIELDBACKGROUND

[0001]

The present invention relates to a device for detecting particles on a windshield of a motor vehicle with a radiation source which emits optical rays onto the windshield with a photodetector, which receives some portion of the rays projected onto the windshield and with a control unit which manages the radiation source and analyzes the rays received by the photodetector.

[0002]

In the sense of this invention, particles are understood to be both drops of liquid (e.g., vapor, rain, etc.) as well as small solid particles (e.g., dust, grains of sand, ice crystals, snow, hail, etc.). Particles are accordingly everything that can hamper vision through the windshield of a motor vehicle.

[0003]

Devices of this kind are known in different embodiments from the prior art. Such devices are normally attached flush to the windshield in the vehicle interior. The area between the radiation source and the photodetector in the device and the windshield is filled with a contact material which possesses a similar optical density to the glass in the windshield. The radiation source emits optical rays onto the windshield. Next to the radiation source is the photodetector, which either receives those rays which were scattered by the particles on the windshield and/or the rays which were reflected by the windshield and not scattered by the particles. The control unit analyzes the rays received by the photodetector. It determines, for example, what type of particles they are and how many of these particles are located on the windshield. The control unit can also take suitable measures to remove these particles from the windshield. The

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measures include, for example, activating a windshield wiper or a windshield washer system.

[0004]

In the case of the known devices, it is disadvantageous that the devices are attached flush to the windshield and the optical rays run inside the windshield. As a consequence, only particles on the outside of the windshield can be detected. Particles on the inside of the windshield cannot normally penetrate between the device and the windshield and consequently are not detected by the known devices. In addition, the contact material which is introduced between the device and the windshield does not possess exactly the same optical density as the glass in the windshield. Consequently, the optical rays are always refracted a little in the transition from the contact material into the windshield and in the reverse direction, whereby the results of the analysis by the device can be falsified. Finally, it proves to be disadvantageous in the known devices that they are positioned outside the vehicle driver's field of view. They are normally located at the upper edge of the windshield which is just barely touched by a windshield wiper. The results of the analysis by the device therefore apply to an area outside the driver's field of view. With particles distributed irregularly on the windshield it can happen that there are no particles deposited in the area of the windshield where the device is located, and consequently the device cannot detect any particles and appropriate measures to remove particles from the windshield are not taken, even although a large number of particles are deposited in the driver's field of view and obstruct his sight. The known device cannot simply be positioned in the driver's field of view because it would otherwise detract from the driver's vision.

[0005]

From the aforementioned disadvantages of the prior art comes the task of the invention to configure and develop a device of this type so that particles in the field of view of a vehicle driver can be detected reliably without the device being located in the driver's field of view.

SUMMARY

[0006] In order to fulfil this task the invention proposes, starting with the device of the type named above, the radiation source is located outside the field of view of a driver of the vehicle and is aligned in such a way that the optical rays from the radiation source strike the windshield in the area of the driver's field of view, and that the photodetector is directed at the area of the windshield where the rays from the radiation source strike it.

[0007] The field of view is the area of the windshield at which the driver of the vehicle looks when he is looking at the roadway ahead of the vehicle. The field of view is approximately equivalent to the area of the windshield which is swept by windshield wipers to remove the particles located on the outside of the windshield. The device according to the invention for detecting particles encompasses a considerably larger area of the windshield than a sensor flush-mounted to the windshield.

[0008] The device according to the invention can be positioned outside the field of view of the driver. The driver's vision is not impaired by a device located within his field of view. Nevertheless, by means of the device according to the invention, the driver's field of vision or another adequately large representative area can be monitored. In this way, particles in the driver's field of vision can be reliably detected. The optical rays preferably strike the windshield at a similar angle as the driver's line of vision strikes the windshield. In this way precisely those particles which result in the driver's vision through the windshield being impaired can be detected.

[0009] The separation of the arrangement of the device in the vehicle and the area to be monitored is made possible by the fact that the device according to the invention departs from the previously normal method of construction and is no longer flush-mounted on the windshield, as was previously customary. Instead an air gap is created between the radiation source and the windshield and between the photodetector and the windshield.

[0010] The device according to the invention has the further advantage that particles can settle in the vehicle interior as well, in the area of the windshield in which the optical rays from the radiation source strike and at which the photodetector is directed. Just like the particles on the outside of the windshield, these particles on the inside of the windshield can also be detected by the device according to the invention.

[0011] In accordance with an advantageous embodiment of the present invention, the radiation source is formed as a light-emitting diode (LED).

[0012] The photodetector preferably possesses several receiving units. The receiving units are advantageously formed as optoelectronic arrays such as charge-coupled device (CCD) image converters.

[0013] In accordance with an advantageous development of the invention, means to focus the rays are positioned in front of the receiving units in the direction of propagation of the rays reflected by the particles. The means to focus the rays are preferably formed as lenses.

[0014] The radiation source preferably emits optical rays with a wavelength of about 350 nm to 800 nm. These optical rays lie within the range of light visible to the human eye. By using optical rays in this frequency range, particles on the vehicle windshield can be detected with particular reliability. However, radiation sources can also be used which emit rays with a wavelength in the infrared range.

[0015] In accordance with a particularly preferred embodiment of the present invention, the control unit manages the radiation source in such a way that the type of particle can be determined from the rays received by the receiver. In this way different measures can be taken as required to remove the particles in question from the windshield. In the case of dirt or dust on the outside of the windshield, the windshield washer system should be activated first and then a windshield wiper, so that the particles can be removed from the windshield without scratching it. In the case of rain, snow or hail it is sufficient to activate a windshield wiper. If extremely small drops

DEUTSCHER PATENT- UND MARKENANWAELTEN
FIRMA DR. H. C. WILHELM, D-8053 MÜNCHEN

of moisture form on the inside of the windshield, known as fogging, the ventilation system can be activated as well as the vehicle interior heating system as needed.

[0016] In order to make it possible to distinguish the type of particle on the windshield with the device in accordance with the invention and in order to be able to determine whether the particles are located on the outside or on the inside of the windshield, the radiation source emits optical rays with different frequencies. The intensity of the rays can also be varied.

Additionally the radiation source can also emit ray pulses of different duration. Depending on the type of particle, all these different optical rays result in characteristic reflections through the corresponding particles. By means of suitable analysis by the control unit of the rays reflected from the particles and received by the photodetector, the type of particle can be determined with great accuracy.

Alternatively, or additionally, the invention proposes in accordance with an advantageous development that the control unit analyzes the rays received by the photodetector by means of suitable algorithms, so that the type of particle can be determined.

[0018] In accordance with a preferred embodiment of the invention the device is an integral part of an interior light module of a motor vehicle. As a result, the device in accordance with the invention can be located unobtrusively for the driver out of his field of vision. However, the device is positioned in such a way that the optical rays from the radiation source can reach the driver's field of vision on the windshield unobstructed. Additionally, the optical rays in the case of a device positioned in this way strike the windshield at a similar angle to the driver's line of sight.

[0019] Alternatively, it is proposed that the device in accordance with the invention is an integral part of a rearview mirror module of a motor vehicle.

[0020] Particular advantages result if the device in accordance with the invention is connected over a bidirectional data bus to a superordinate

control unit in the vehicle. In this way the results of the analysis from the device can be supplied to the control unit and processed there. So the control unit can, for example, in conditions of heavy rain or thick blowing snow cause the potential top speed of the vehicle to be restricted or activate the vehicle lighting system.

BRIEF DESCRIPTION OF THE DRAWING

[0021] A preferred embodiment of the present invention is explained in greater detail below using the drawings in which:

[0022] Figure 1 shows a schematic view of a device under the invention; and

[0023] Figure 2 shows a side view of a device under the invention in accordance with an initial embodiment.

[0024]DETAILED DESCRIPTION

[0025] In Figure 1 the device of the invention is identified in its entirety with the reference numeral 1. The device 1 is used to detect particles 2 on a windshield 3 of a motor vehicle 10 (see Fig. 2). The device 1 possesses a radiation source 4 which emits optical rays 5 onto the windshield 3. The radiation source 4 is formed as a light-emitting diode (LED). In addition, the device 1 possesses a photodetector which receives the optical rays 7 reflected from the particles 2 on the windshield 3. The photodetector is designed as a charge-coupled device (CCD) image converter. Finally, the device 1 possesses a control unit 8 which manages the radiation source 4 by means of control signals 9 and which analyzes the optical rays 7 received by the photodetector 6. Means 12 for focusing the optical rays 5, 7 are located in the direction of propagation of the beams 5 after the radiation source 4 and in the direction of propagation of the beams 7 in front of the photodetector 6. The means 12 for focusing the beams 5, 7 are formed as lenses. The device 1 according to the invention is connected over a bidirectional data bus 9 to a superordinate control unit (not shown) in the vehicle 10.

[0026]

Figure 2 shows a section of the interior of a motor vehicle 10. A unit 11 made up of an interior light module 11a and rearview mirror module 11b is located in the roof of the vehicle 10. The device 1 of the invention is an integral part of this unit 11. The device 1 is positioned outside the field of view of the driver (not shown) of the vehicle 10 and does not obstruct the driver's view of the road in front of the vehicle 10. The optical rays 5 from the radiation source 4 can strike the driver's field of view on the windshield 3 of the vehicle 10 unobstructed, and the optical rays 7 reflected from the particles 2 on the windshield 3 can reach the photodetector 6 unobstructed.

What Is Claimed Is::

[0027] 1. Device (1) for detecting particles (2) on a windshield (3) of a motor vehicle (10), with a radiation source (4) which emits optical rays (5) onto the windshield (3), with a photodetector (6), which receives a portion of the rays (5) emitted onto the windshield (3), and with a control unit (8), which manages the radiation source (4) and analyzes the rays (7) received by the photodetector (6), characterized in that the radiation source (4) is positioned outside the field of vision of a driver of the vehicle (10) and is aligned in such a way that the light rays (5) from the radiation source (4) strike the windshield (3) in the area of the field of vision, and that the photodetector (6) is pointed at the area of the windshield (3) which the optical rays (5) from the radiation source (4) strike.

[0028] 2. Device (1) in accordance with claim 1, wherein the radiation source (4) is formed as a light-emitting-diode (LED).

[0029] 3. Device (1) in accordance with claim 1 or 2, wherein the photodetector (6) possesses several receiving units.

[0030] 4. Device (1) in accordance with claim 3, wherein the receiving units are formed as optoelectronic arrays such as, for example, charge-coupled device (CCD) image converters.

[0031] 5. Device (1) in accordance with claim 3 or 4, wherein means (12) are located in the direction of propagation of the beams (7) reflected from the particles (2) in front of the receiving units for focusing the beams.

[0032] 6. Device (1) in accordance with claim 5, wherein the means (12) for focusing the beams are formed as lenses.

[0033] 7. Device (1) in accordance with one of the claims 1 to 6, wherein the radiation source (4) emits optical rays (5) with a wavelength of about 350 nm to 800 nm

[0034] 8. Device (1) in accordance with one of the claims 1 to 6, wherein the radiation source (4) emits optical rays with a wavelength in the infrared range.

[0035] 9. Device (1) in accordance with one of the claims 1 and 8, wherein the control unit (8) manages the radiation source (4) in such a way that the type of particles can be determined from the rays (7) received by the photodetector.

[0036] 10. Device (1) in accordance with one of the claims 1 to 9, wherein the control unit (8) analyzes the rays received by the detector (7) by means of suitable algorithms so that the type of particles (2) can be determined.

[0037] 11. Device (1) in accordance with one of the claims 1 to 10, wherein the device (1) is an integral part of an interior light module in the vehicle (10).

[0038] 12. Device (1) in accordance with one of the claims 1 to 10, wherein the device (1) is an integral part of a rearview mirror module in the vehicle (10).

[0039] 13. Device (1) in accordance with one of the claims 1 to 12, wherein the device (1) is connected over a bidirectional data bus to a superordinate control unit in the vehicle (10).

ABSTRACT

[0040]

The present device detects on a windshield of a motor vehicle with a radiation source which emits optical rays onto the windshield with a photodetector which receives a portion of the optical rays emitted onto the windshield, and with a control unit which manages the radiation source and analyzes the light rays received by the photodetector. In order to be able to reliably detect particles in the field of vision of a driver of the vehicle using a device of this type, without the device being positioned in the driver's field of vision, the invention proposes that the radiation source is aligned in such a way that the light rays from the radiation source strike the windshield in the area of the field of vision of a driver of the vehicle and that the photodetector is pointed at the area of the windshield which the optical rays from the radiation source strike.

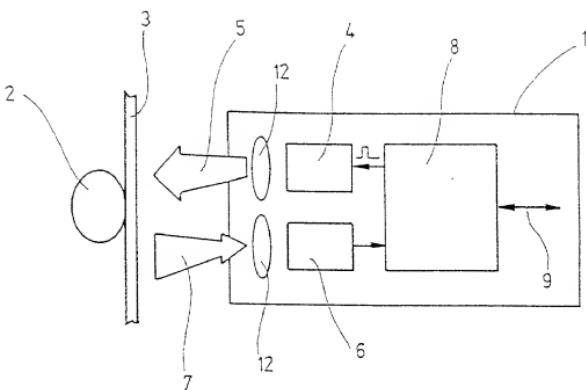


Fig.1

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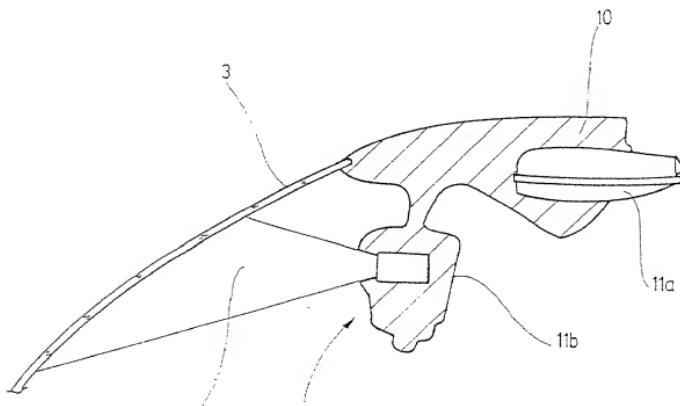


Fig.2

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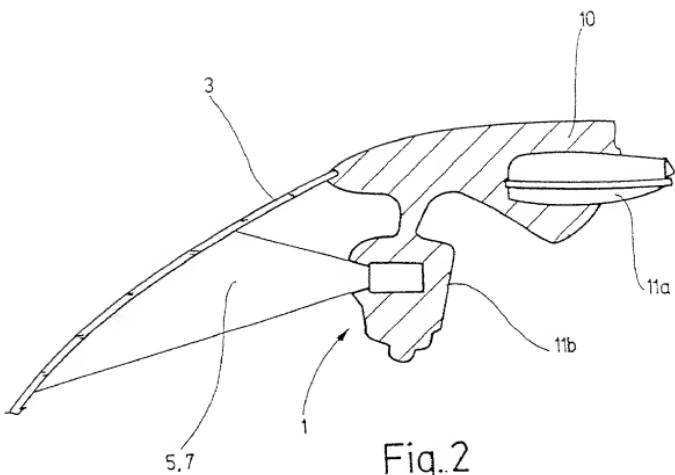


Fig. 2

09/856815 " 090704



Our Reference: VMP-491-A (MP9585)

COMBINED DECLARATION AND POWER OF ATTORNEY**DECLARATION:**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

DEVICE FOR DETECTING PARTICLES ON A WINDSHIELD

the specification of which (check only one item below):

 is attached hereto. was filed as United States application Serial No. _____ on _____, and was amended on or through _____ (if applicable). was filed as PCT international application Number **PCT/EP99/07327** on **04 September 1999**, and was amended under PCT Article 19 on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119:			Priority Claimed
(Number)	(Country)	(Day/Mo/Yr Filed)	[X] []
(Number)	(Country)	(Day/Mo/Yr Filed)	[] []
			Yes No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)
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(Application Number)	(Filing Date)
----------------------	---------------

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C. §120:

(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)

Combined Dec.
POWER OF ATTORNEY:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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